VERIFICATION OF A TRANSLATION

I, Henry M. Feiereisen, having a place of business at 350 Fifth Avenue, Suite 4714, New York, N.Y. 10118, depose and state that:

1. I am familiar with the English and German languages.

2. I have read German language Application No. 103 05 368.9, filed February 10, 2003.

3. The hereto attached English language text is an accurate translation thereof.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: March 1, 2007

HENRY M. FEIEREISEN

FEDERAL REPUBLIC OF GERMANY

Priority Certificate Regarding the Filing of a Patent Application

File Number:	103 05 368.9
Date of Filing:	10 February 2003
Applicant/Owner:	Siemens Aktiengesellschaft, Munich/DE
Title	Electric Machine with Temperature Monitoring
IPC:	H 02 K 11/00

The attached pieces are a true and accurate copy of the original documents of this patent application.

Munich, 28 October 2003
German Patent and Trademark Office
The Commissioner
On behalf of

Description

Electric Machine with Temperature Monitoring

The present invention relates to an electric machine with several components, such as stator, rotor, windings, bearing arrangements, whose temperature is being monitored during operation, with the components including temperature probes which ascertain the absolute temperatures.

To operate an electric machine at maximum power, the temperature of various components of an electric machine, like, e.g., the stators, the rotors, and the windings, or bearing arrangements, is mandatory. A particular important factor for the capability of the electric machine is hereby the maximally admissible winding temperature. Exceeding an admissible winding temperature results possibly in a destruction of the electric machine.

To date, the temperature of such electric machines has been ascertained through the provision of temperature probes that were integrated in a winding end portion. This temperature detection suffers the following shortcomings. A thermal linkage of the sensor directly influences the quality of the measuring value, and since the temperature sensor has a predefined mass, it has also a thermal time constant that prevents a correlation of the measuring value with the actual temperature value of the winding. Moreover, as the provision of an additional electric insulation of the temperature sensor is required, the time constant is increased again, thereby further deteriorating the thermal linkage.

DD 222 116 A1 discloses a method and device for contactless temperature measurement on moving bodies, in particular stators or rotors of larger electric machines, whereby the windings have to be heated to different temperatures for trickle impregnation, jellying and hardening of the impregnating agent. Execution

of the method is clearly directed to the manufacturing process of the electric machine and is unsuitable for ascertaining a temperature of the electric machine during operation.

DE 22 42 243 discloses a method for control of the assembly quality of the active stator iron of electric machines, such as, e.g., turbo-generators, that is used during the manufacturing process of the electric machine.

The known methods relate predominantly to methods during assembly and are unsuitable for operational monitoring systems.

The invention is therefore based on the object to provide an electric machine which is constructed with a temperature monitoring system that is comparably simple and ensures an exact current temperature to thereby allow operation of the electric machine at maximum capacity, even when the electric machine runs in a highly dynamic manner.

The solution of the posed object is attained by providing temperature radiation sensors as temperature probes, which detect and measure heat radiation in a contactless manner.

Detection and determination of heat radiation involves the arrangement of a sensor, in particular an infrared detector, within the electric machine in such a manner as to be able to detect the radiation of the components, such as stator, rotor, winding and bearing arrangements. This results in a real-time determination of the temperature of the respective components, in particular of the windings. As a consequence, the winding can be protected from overheating, especially when operating the electric machine in a highly dynamic manner.

Such a high-dynamic operation occurs in particular when machine tools are

involved. Thus, the electric machines can be operated in an optimum manner up to their maximum power.

Advantageously, transmission of data of rotating components, such as, e.g., a rotor, or parts which operate under voltage, becomes thus possible in a simple manner.

Using suitable evaluation devices on the machine or in a control station establishes a thermographic image of the machine as a consequence of received temperatures. In this way, weak thermal areas of the machine can be ascertained and, if need be, eliminated.

In an advantageous embodiment of the invention, the evaluation device reacts in the event of excess temperatures in such a manner that certain cooling systems can be activated or if possible, rotation speeds of the motors can be reduced.

Schematically illustrated exemplary embodiments of the invention as well as further advantageous configurations of the invention according to features set forth in the subclaims will now be described in greater detail with reference to the accompanying drawing.

FIG. 1 shows the longitudinal section of an electric machine 1, depicted by way of example, having a stator 6 provided with substantially axial slots, not shown in greater detail, for receiving a winding 5, with the winding 5 terminating in winding end portions 3 at the end surfaces of the lamination core of the stator 6. The rotor 7 is placed on a shaft 9 and suitably supported on both sides by bearing arrangements 8.

Located in the housing of the electric machine 1 at predetermined locations are infrared detectors 2 which are connected to an evaluation device 4. The evaluation

device 4 can control a fan 10, when predefined temperature thresholds of the components, like winding end portion 3, stator 6, winding 5, rotor 7 and bearing arrangement 8, have been exceeded.

Furthermore, the evaluation device 4 has advantageously access to a power section, not shown in greater detail, of the electric machine 1 and can thus influence the rotation speed and, optionally, run the electric machine 1 at less than maximum operation.

Unlike comparable systems, the provision of the radiation detectors 2 enables the absence of thermal time constants as a consequence of masses of e.g. temperature sensors to be secured to the winding end portion 3. In addition, there is no need to provide an electric insulation of the probe. Thus, the time constants of the infrared sensors 2 are significantly shorter and a precise thermal image of the electric machine can be created, in particular when the electric machine is operated in a highly dynamic manner. As a result, the electric machine can be operated at maximum capacity.

Patent Claims

1. Electric machine (1) with several components, like stator (6), rotor (7), windings (5), bearing arrangements (8), whose temperature is being monitored during operation, with the components including temperature probes which ascertain the absolute temperatures, characterized in that the temperature probes are temperature radiation detectors (2) for contactless determination and/or measurement of radiating heat.

2. Electric machine (1) according to claim 1, characterized in that the contactless temperature measurement can be executed at rotating components and/or components operating under voltage.

3. Electric machine (1) according to claim 1 or 2, characterized in that the contactless temperature measurement can be executed by means of an infrared measuring system (2, 4).

4. Electric machine (1) according to one of the preceding claims, characterized in that the temperature probe(s) is/are arranged within the electric machine (1) such that a thermographic image of the electric machine (1) can be established at predetermined time instances via a suitable evaluation device (4).

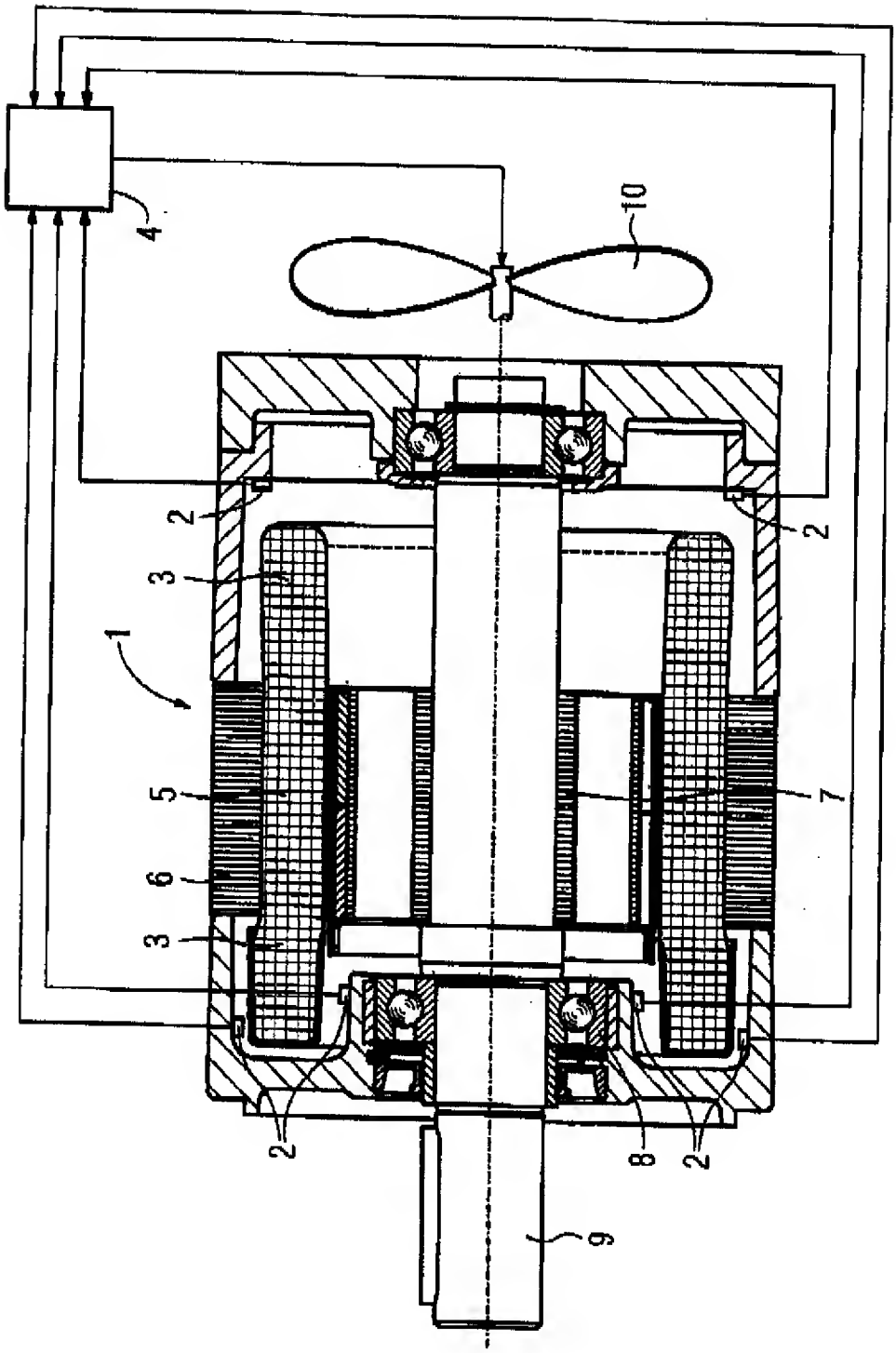
5. Electric machine (1) according to claim 4, characterized in that operating parameters like rotation speed of the electric machine (8), rotation speed of fans (10) etc., can be influenced via the evaluation device.

ABSTRACT

Electric Machine with Temperature Monitoring

In order to attain a current temperature detection of the relevant components of an electric machine (1) in order to be able to run the electric machine up to its maximum capacity also when high-dynamic operation is involved, the temperature of the individual components is ascertained and/or measured via temperature radiation sensors (2) in a contactless manner.

FIG. 1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